

and falling $\frac{1}{2}$ to 1 inch in half an hour. *Prinses Wilhelmina* at Tandjong Priok : 789-763mm. (*Nieuw. Rotterd.* Nov. 26) (789 seems a misprint, *Nieuws van den Dag* has 750, perhaps it should be 759). *Loudon* : extremely high.

3. Compasses. Spun round (*Loudon*).

4. Degree of darkness. From all reports results that there was a moment when "no outlines of ship or men were seen." From the report of the *Annesley* results that the darkness continued after the downpour of ashes had ceased, therefore the darkness is not depending on the pouring down of ashes ; it is sufficient that the sunlight be intercepted by a thick cloud of ashes. From the *Berbice* is reported :—Darkness from 26th, p.m., to 28th, a.m. From all other places is reported :—Bright, August 27, from 6 to 9 a.m., and 28th, from 6 a.m.

5. After having read the reports, the question arose to me, Was the mud ejected from the crater, or were the ashes, &c., mixed with rain or sea water? I think the latter ; I remember, at least, that in 1863 (an eruption of the Merapi, Java, took place) I came into a slight downpour of ashes. I was travelling on horseback, and after some time a thunderstorm came on. All around me, which had been ashes before, was changed very soon into mud. In the report of the *Berbice* the "rain of mud" is not mentioned, but it is said that the yards were covered with a "crust," because a slight rain had met the ashes, which, however, on deck were still "ashes," because, I suppose, the rain was not hard enough to change such a thick layer into a "crust."

6. Detonations, though they were heard in Saigon, Singapore, Acheen, Ceylon, &c., were not heard on board the *Loudon*. I think this might be explained by the thunderstorm, the pouring down of mud into the sea, and the hurricane (which in Lampong Bay did more damage than the wave itself).

7. The part of Krakatoa which has disappeared sank probably August 27 ; at least in the report from the *Loudon* the island is described as it is now. From the *Berbice*, however, it is reported :—Saw it divided in three parts (29th) ; but probably they saw the remains of Krakatoa, Verlaten Island, and Lang Island, which before, when seen from the east, appeared as one island.

8. Sibessie was from the sea to the top buried under ashes (all people killed).

9. The floating pumice-stone was, in the Lampong Bay, in September, 14 feet thick ; in the Semungka Bay it was very strong too. Probably, if circumstances are favourable, new islands are to be formed ; though at the end of October steamers came to Telok Betong, in November a hopper-barge was, during eleven days in the Lampong Bay, beset by pumice-stone.

Besides this I beg to record :—

10. After the eruption of Krakatoa in the Indies many volcanic phenomena were observed, and they prophesied an eruption of Mount Merapi (Java) for February next. Whether they had heard of Mr. Delaunay's prophecies I am unacquainted with.

11. Up to November 1 they counted 32,635 persons killed by the eruption, &c. For the burial of the corpses the Government had spent 6000*l*.

When the Survey under my direction (1868-69) was busy connecting the triangles of Java with the Sumatra coast, the peak of Krakatoa was also chosen for a point.

Whether there were several hills on the island I cannot say, for when I saw Krakatoa it was covered with a splendid vegetation, and in such a case it is not so easy to judge of the configuration as it is when the trees are burnt, but I dare say there was only one peak.

Of the results of the Survey I keep only a map, of which I inclose a rough copy. From this it results that the signal was a little to the north of $6^{\circ} 8\frac{1}{2}'$; Kuyper puts it in $6^{\circ} 9'$, which is certainly wrong ; he inserts also a peak in the centre of the island (622 metres), and says it had disappeared ; this is, I am sure, a mistake. If the

military survey (which was at work now) had not yet finished its work so far as to give a map of Krakatoa (though perhaps they have not undertaken a survey of the island, since administratively it belongs to the Lampongs, and not to Bantam), it might perhaps be useful to consult the notes of the *Geographische Dienst*, which are deposited in the Archives, and a sketch of the Sunda Straits, which I offered in 1875 to the Minister of the Dutch colonies.

E. METZGER

Stuttgart, January

NOTES

WE regret to learn that Mr. C. W. Merrifield died at Brighton on New Year's Day at the age of fifty-six.

MANY of the friends of the late Dr. Hermann Müller in this country will be glad of the opportunity of testifying to their respect for his memory and their sense of the value of his work by contributing to the fund which is being raised to establish a "Müller Foundation." In the first instance the proceeds will be used to assist the widow of Dr. Müller during her lifetime, and afterwards as an endowment to some poor and deserving student at the Public School of Lippstadt desirous of devoting himself to natural science. An influential Committee has already been appointed on the Continent, including the name of Prof. Haeckel. The movement, we are sure, will commend itself to many of our readers, who may send their subscriptions either to Herr Stadtkämmerer Wilhelm Thurmman, Lippstadt, or to the care of the Editor of NATURE.

FIVE HUNDRED POUNDS in prizes are offered by Mr. Francis Galton for extracts from the family records of competitors. They are to be sent him before May 15, drawn up according to the conditions and under the restrictions published in his recent book, "Record of Family Faculties" (Macmillan and Co., 2*s.* 6*d.*), which contains full explanations, together with sufficient blank forms for the records of a single family.

M. BOULEY has almost unanimously been appointed Vice-President of the Paris Academy of Sciences for 1884, and President for 1885.

EARTH tremors seem to have been of almost daily occurrence in Tasmania recently. Mr. J. R. Hurst of Longwood, near Moorina in the north-east of the colony, sends to the *Launceston Examiner* of November 12 a record extending from August 31 to October 20, 1883, noting the occurrence of several daily, some of them so serious as to be alarming. In a note in its issue of November 19 the *Examiner* says :—"The vibratory motions of the earth's surface which have been so frequent for several months past still continue with a periodicity which is at least remarkable. Ordinary tremors now scarcely arrest attention, but occasionally a quivering of unusual severity startles those who happen to notice it, and reminds them that there are forces in operation in nature which are mysterious and appalling. One of these occurred yesterday afternoon about six minutes to three o'clock, which was felt in every part of the town, and set windows and furniture rattling. Some persons fancied that they could detect a distinct undulatory motion. The shock lasted for twelve or fifteen seconds. It may be mentioned that the whole of yesterday was very stormy—frequent and heavy showers of rain, with thunder and hail, and a very low barometer. Last evening the mercury began to rise."

PROF. J. P. LICHERDOPOL writes from Bucharest, Roumania, that on January 1, at 6.13 a.m., two horizontal shocks of earthquake, from north to south and *vice versa*, were felt there, and were preceded by a loud noise, as of a distant train coming from the north. The furniture was slightly shaken and crackings were heard. The atmosphere was calm, but charged with a very

thick and persistent fog.—Earthquake shocks were also felt during 'Sunday week in various parts of France. At Argèles (Hautes Pyrénées) there was one in the early morning, a second at nine o'clock, and a third about mid-day. At Dorignies, an industrial hamlet near Douai (Nord), the shock was sufficiently strong to cause real alarm. It occurred between six and seven in the evening. Houses shook, their timbers cracked, and glass and earthenware in cupboards were shattered.

THE Hungarian astronomer, Herr von Konkoly, who is mentioned as the future director of the Brussels Observatory, is expected to arrive there in about a week, for the purpose of explaining to the Science Department of the Belgian Academy his recent discovery relative to the cometary spectrum.

WE understand that Messrs. McLachlan and Fitch, having been appointed by the Entomological Society of London a committee for the purpose of examining, and reporting upon, certain vine-roots forwarded by the Government of Victoria, through Kew, find as the result of their examination that the *Phylloxera* is present in considerable numbers on the roots, which were those remaining in the ground after the vines themselves had been destroyed.

A TELEGRAM has been received from Prof. Hull, F.R.S., the chief of the Geological Expedition to the Holy Land, announcing the safe arrival of himself and his party at Gaza, where they are at present detained in quarantine. A letter, dated December 2, was also received from him a few days ago, which has been brought by camel post *vidé* Nakihl from Akabah, where the party arrived on November 27. In this letter Prof. Hull writes:—"We had every reason to be satisfied with the conduct of our Towarah Arabs. We spent three days in the neighbourhood of Jebel Musa, and made the ascent of the mountain, from the top of which Major Kitchener took angles to several prominent points; while on the same day Mr. Hart ascended Mount Catharina, a feat hitherto unperformed in one day, and was rewarded by finding several plants—representatives of colder climates. From Jebel Musa to Akabah we took the upper route, partially explored by Palmer. This has enabled us to add considerably to the accuracy of the geology and topography of the district; we have also taken a considerable number of photographs. On Saturday week we traversed a magnificent gorge cut through granite cliffs and extending for several miles, which, we believe, has not hitherto been described. It commences at the head of the Wady el Ain. We found the escarpment of the Tih much more broken and indeterminate than is represented in the maps, owing to the existence of several large faults or dislocations of the strata which traverse that district in a generally northerly and southerly direction, and we have finally determined the position of the leading line of fracture to which, at least, this portion of the Wady el Arabah owes its existence. Our course through to the Dead Sea by the valley is barred, owing to a blood feud between two tribes. We have, however, contracted with one of the tribes to be escorted as far as the Wady Musa and Petra, after which we shall strike off west across Tih Plateau to Gaza. This will enable us to do the greater part of the work in the Wady Arabah which we proposed. We are all in good health, and have made excellent collections to illustrate the botany, geology, and zoology of the district."

THE budget of the Ministry of Public Instruction in France reaches the unprecedented sum of six millions sterling. Half of this sum is absorbed by the primary and infant schools. The dotation for astronomy and meteorology is 40,000*l.*, exclusive of municipal credits voted by Marseilles, Toulouse, Bordeaux, Lyons, for their astronomical observatories; Besançon, Clermont, Paris, and Toulouse, for Besançon, Puy de Dôme, Montsouris, and Pic du Midi meteorological establishments. The

National Library of Paris receives 30,000*l.*, and other public libraries in Paris, 11,000*l.*; National Archives, 8000*l.* The pecuniary grants given to learned men amount to 8000*l.*; voyages and missions, 11,000*l.*; Collège de France, 20,000*l.*; Superior Normal School, 20,000*l.*; National Institute, 28,800*l.*; Academy of Medicine, 3000*l.*; School of Hautes-Études, 19,000*l.*; Faculté d'État (Universities), 400,000*l.*; Grammar Schools (Lycées), 319,000*l.*; Museum (Jardin des Plantes), about 40,000*l.*

THE following arrangements have been made for the meetings of the Society of Arts. The papers to be read at the ordinary meetings will be:—Electric Launches, by A. Reckenzaun; Science Teaching in Elementary Schools, by William Lant Carpenter; Coal Gas as a Labour-Saving Agent in Mechanical Trades, by Thomas Fletcher; Sanitary Progress, by B. W. Richardson, F.R.S.; The Progress of Electric Lighting, by W. H. Preece, F.R.S.; Forest Administration in India, by Dr. Brandis, F.R.S.; Reclamation of Land on the North-Western Coast of England, by Hyde Clarke; Water Regulation in England, by General Rundall; Telpherage, by Prof. Fleeming Jenkin, F.R.S.; New Process of Permanent Mural Painting (invented by Adolph Keim, Munich), by Rev. J. A. Rivington; Slate Quarrying, by W. A. Darbishire. At the meetings of the Sections the following papers will be read:—Foreign and Colonial Section—Canada as it will appear to the British Association in 1884, by Joseph G. Colmer, Secretary to the High Commissioner for Canada; The Portuguese Colonies of West Africa, by H. H. Johnston; Reflections on Chinese History, with reference to the present situation of affairs, by Demetrius G. Boulger; Borneo and its Products, by B. Francis Cobb; The Rivers Congo and Niger as Entrances to Mid-Africa, by R. Capper. Applied Chemistry and Physics Section—Manufacture of Gas from Lined Coal, by Prof. Wanklyn and W. J. Cooper; The Upper Thames as a Source of Water Supply, by Dr. Percy F. Frankland; Cupro-Ammonium Solution and its Use in Waterproofing Paper and Vegetable Tissues, by C. R. Alder Wright, F.R.S.; Economic Applications of Seaweed, by Edward C. Stanford. Indian Section—State Monopoly of Railways in India, by J. M. Maclean; The New Bengal Rent Bill, by W. Seton-Karr; Trade Routes in Afghanistan, by Griffin W. Vyse; The Existing Law of Landlord and Tenant in India, by W. G. Pedder. The courses of Cantor lectures will be on Recent Improvements in Photo-Mechanical Printing Methods, by Thomas Bolas; The Building of London Houses, by Robert W. Edis, F.S.A.; The Alloys used for Coinage, by Prof. W. Chandler Roberts, F.R.S., Chemist of the Royal Mint; Some New Optical Instruments and Arrangements, by J. Norman Lockyer, F.R.S.; Fermentation and Distillation, by Prof. W. Noel Hartley.

THE Portuguese explorers, Senhores Capello and Ivens, have just sailed for West Africa. They proceed first to Loanda, thence northward to Zaire. It is expected that they will be absent for about two years.

M. ACHARD's continuous electric brake has been worked successfully in competition with the Westinghouse and other systems. The electricity is obtained by a dynamo worked by the train itself, and can give light for signals and other purposes, when worked by the engine. The sliding valve of locomotives for admitting steam has been replaced by a piston, which renders similar service. A large diminution of friction and wear results from this improvement. The economy in coals is stated to have been 5 per cent.

DR. NACHTIGAL, the well-known African traveller, who is now German Consul-General at Tunis, has received the gold medal for Art and Sciences from the Grand Duke of Mecklenburg-Schwerin.

THE members of the International Polar Commission will meet in Vienna early in May next, where preparations for this meeting are already being made.

THE death is announced of Dr. Wilhelm Gintl, an eminent telegraph engineer, and formerly director of all Austrian telegraphs. He died at Prague on December 22, 1883, aged eighty years.

LIEUT. WOHLGEMUTH, the leader of the Austrian Polar Expedition, has read a paper on the results of the Expedition at the last meeting of the Vienna Geographical Society; 124 auroræ were observed, amongst which about ten were crown-shaped. Amongst the old lava streams and in the crevices of the numerous craters of the island of Jan Mayen, Lieut. Wohlgemuth found traces of a still progressing volcanic activity, and three times observed well-marked subterranean shocks.

A SERIES of ornithological observatories has been established throughout Austria-Hungary at the instance of Crown Prince Rudolf, with a view of paying special attention to the migrations of birds, as well as to their breeding habits. The work done by these stations is satisfactory enough; yet it has been found that a complete insight into the periodical movements of birds cannot be obtained so long as similar stations are not spread over the whole globe. The subject is to form one of the principal topics for discussion at the approaching Ornithological Congress, which will be held under the auspices of the Crown Prince at Vienna on April 16 next and the following days.

AT Cobern, near Coblenz, a Franconian burial-ground has been discovered, containing many objects of interest, such as ornaments, weapon; glass and clay vases, stones with inscriptions, &c.

THE Turin Academy of Sciences has given a prize (480*l.*) to Mr. Hormuzd Rassam for his discoveries in the domain of Assyrian and Babylonian antiquities.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus* ♀) from India, presented by Madame Kettner; two Rhesus Monkeys (*Macacus rhesus* ♂ ♀) from India, presented by Mr. G. Glyn Petre, F.Z.S.; a White-throated Capuchin (*Cebus albifrons* ♀), a Crab-eating Opossum (*Didelphys cancrivora*) from the West Indies, presented by Lady Brassey, F.Z.S.; a Common Genet (*Genetta vulgaris*) from West Africa, presented by Capt. A. North Daniel; a Canadian Porcupine (*Erethizon dorsatus*) from North America, presented by Mr. A. Glidden; a Kinkajou (*Cercoptes caudivolvulus*) from Brazil, presented by Dr. Byres Moir; a Ring-hals Snake (*Sepedon hamachates*), a Robben Island Snake (*Coronella phocorum*), an Egyptian Cobra (*Naia haje*), a Rhomb-marked Snake (*Psammophylax rhombeatus*), a Many-spotted Snake (*Coronella multimaculata*), a Hissing Sand Snake (*Psammophis sibilans*), a Smooth-bellied Snake (*Homalosa lutrix*), a Spotted Slow-worm (*Acontias meleagris*) from South Africa, presented by the Rev. G. H. R. Fisk, C.M.Z.S.; two Gold Pheasants (*Thaumalea picta* ♂ ♀) from China, two Common Peafowls (*Pavo cristatus* ♂ ♀) from India, deposited; five Knots (*Tringa canutus*), a Common Guillemot (*Lomvia troile*), British, purchased.

OUR ASTRONOMICAL COLUMN

THE SOLAR MOTION IN SPACE.—The recently published volume of the *Memoirs of the Royal Astronomical Society* contains a paper by Mr. W. E. Plummer, of the Oxford University Observatory, on the Motion of the Solar System. The data on which the author has founded his discussion are the proper motions of the stars in the southern hemisphere, as determined by Mr. Stone in the Cape Catalogue. The work is therefore a repetition and extension of the inquiry conducted by the late

Mr. Galloway, and it would appear that the necessity of a re-discussion was suggested to Mr. Plummer by the discrepancies between the values of the proper motions there employed and those given by Mr. Stone. To illustrate the uncertainty in the result, particularly when based upon an insufficient number of stars, the position of the apex of the solar system is first derived from the same list of stars as that used by Mr. Galloway, but with improved values of the proper motion. The more trustworthy result from these restricted data places the apex in the constellation Ophiuchus some thirty degrees south of the generally received position.

Incorporating, however, all the southern stars whose known proper motions exceed one-tenth of a second (which raises the number of stars employed to 274), a more accordant result is obtained. If the apparent magnitude be adopted as a criterion of distance, and the irregularities of proper motion be supposed due to the peculiar motions of the stars themselves, the co-ordinates of the apex are $\alpha = 270^{\circ} 8'$, $\delta = +20^{\circ} 20'$, and the annual motion of the sun, viewed from the mean distance of the first magnitude stars, subtends an arc of $1''.690$. Unfortunately, if the corrections computed on this supposition be applied to the individual proper motions, the sum of the squares of the residuals is slightly larger than the sum of the squares of the original motions.

Selecting as a second hypothesis the suggestion that the distances of the stars vary inversely as their proper motions, the position of the apex is given in $\alpha = 276^{\circ} 8'$ and $\delta = +26^{\circ} 31'$, and the annual motion of the sun seen from the distance of stars whose annual proper motion is about $1''.5$ seconds of arc, is $0''.926$. Introducing the necessary corrections, the sum of the squares of the proper motion in R.A. is reduced from $124''.9$ to $70''.4$, and in declination from $54''.6$ to $39''.3$, a result that tends to support the reality of the second hypothesis.

THE LATE M. YVON VILLARCEAU. — Antoine-François-Joseph-Yvon Villarceau was born at Vendôme on January 15, 1813. He first studied in the local college, and subsequently went through the course of instruction at the Conservatoire in Paris, where, in 1833, he gained a first prize. In the same year he proceeded to Egypt with Melicien David, and joined the mission under Enfantin: in this way his attention was directed to engineering. Returning to France in 1837 he was admitted to the École Centrale, which he left in 1840, being then first in the Mechanical Section. Already possessed of an independent fortune, in the years immediately following he was chiefly occupied with mathematical studies, with the view to qualify himself for the higher branches of mechanics and astronomy. In 1845 his first memoir upon comets, which was judged worthy of insertion in the "Recueil des Savants Etrangers," brought him under the notice of Arago, who, impressed with the originality of his ideas, offered him, in 1846, a place at the Observatory of Paris, to which establishment he was attached until the close of his life, at first as assistant, and since 1854 as titular astronomer. Villarceau was the author of a large number of memoirs upon mechanical and geodetical subjects, amongst others, on the stability of locomotives in motion, and on the theory of arches, accompanied by extensive tables and numerous practical applications, on the theory of the gyroscope of Foucault, and the compensation of chronometers; he made geodetical determinations in France between 1861 and 1865, which led to several important deductions. Amongst his earlier astronomical work was the development and application of a new method of investigating the orbits of the revolving double-stars, which he applied to η Coronæ Borealis and other binaries; this was followed by a memoir on the determination of the orbit of a planet, founded on the method of Laplace. In 1851, on the discovery by D'Arrest of the short-period comet which bears his name, Villarceau determined the orbit rigorously, and by means of his predicted places the comet was again observed, in 1857, by Maclear at the Cape of Good Hope. It was upon his plans that, while Leverrier was in direction of the Observatory of Paris, the great equatorial in the west tower, which constituted a notable advance in the construction of such astronomical instruments, was erected. Villarceau died on December 23. At the funeral discourses were delivered by Col. Perrier in the name of the Academy of Sciences (of which Villarceau had been a member, in the Section of Hydrography and Navigation, since 1867); by M. Faye in the name of the Bureau des Longitudes; and by M. Tisserand in that of the Paris Observatory.